WHAT IS CLAIMED IS:

1.   A method for operating a coincidence imaging system, said method comprising:

receiving samples from a detector output; and

determining an intersection of a first line corresponding to a baseline portion of the detector output samples and a second line corresponding to a pulse rise portion of the detector output samples.

2.   A method in accordance with Claim 1 wherein determining an intersection of a first line and a second line comprises determining an intersection of a first line and a second line wherein the intersection defines an event time.

3.   A method in accordance with Claim 1 wherein determining an intersection of a first line corresponding to a baseline portion of the detector output samples and a second line corresponding to a pulse rise portion of the detector output samples comprises determining an intersection of a first line corresponding to a baseline portion of the detector output samples wherein the baseline portion is defined by a plurality of detector output samples preceding the pulse rise portion, and a second line corresponding to a pulse rise portion of the detector output samples.

4.   A method in accordance with Claim 1 further comprising determining the start of an event based upon a voltage difference between successive samples.

5.   A method in accordance with Claim 1 wherein receiving samples from a detector output comprises sampling a detector output using an analog-to-digital converter.

6.   A method in accordance with Claim 5 wherein sampling a detector output using an analog-to-digital converter comprises sampling a detector output using an analog-to-digital converter at a predetermined rate that is sufficient to obtain a plurality of samples during the pulse rise portion.

7.   A method in accordance with Claim 6 wherein N represents a predetermined number of accumulators, and wherein sampling a detector output using an analog-to-digital converter comprises:

summing N successive voltage measurements; and

transmitting the sums to a shift register, such that successive elements of the shift register include:

$$\sum_{i=1}^{N} V_i, \quad \sum_{i=1}^{N} V_{i+1}, \quad \sum_{i=1}^{N} V_{i+2}, \quad \sum_{i=1}^{N} V_{i+3}, \quad \sum_{i=1}^{N} V_{i+4}, \quad \sum_{i=1}^{N} V_{i+5}, \quad \cdots$$

8.   A method in accordance with Claim 7 further comprising:

detecting a scintillation event; and

transmitting an output from the shift register to a computational logic circuit.

9.   A method in accordance with Claim 1 wherein determining an intersection comprises:

selecting a sampled point on the pulse rise portion as the origin of a y-axis; and

determining a slope of the second line using the equation, $y=m_2t+b_2$, where,

m_2 is the slope of the second line; and

b_2 is the intercept of the second line with the y-axis.

10.   A method in accordance with Claim 1 wherein determining an intersection comprises determining a slope of the first line using the equation, $y=m_1t+b_1$, where,

m_1 is the slope of the first line; and

b_1 is the intercept of the first line with the y-axis.

11.   A method in accordance with Claim 1 further comprising determining a time of the intersection from the equation, $t=-(b_1-b_2)/m_1$, where,

t is the time of the start of the intersection and the y-axis in units of a sampling interval,

b_2 is an average of a predetermined number of baseline samples,

b_1 is an average of a predetermined number of baseline portion samples and a predetermined number of pulse rise portion samples, and

m_1 is the slope of the straight line fitted through the pulse rise portion of the detector output samples.

12.   A method in accordance with Claim 1 further comprising generating a trigger pulse at a determined time interval after the start of the rise pulse.

13.   A method in accordance with Claim 12 further comprising time-stamping each trigger pulse.

14.   A method for operating a coincidence imaging system, said method comprising:

sampling a detector output that includes a pulse, that has a baseline portion and a pulse rise portion, using an analog-to-digital converter at a predetermined sample rate, such that the sample rate is sufficient to obtain a plurality of samples during the pulse rise portion;

determining a slope of a first line fitted through a baseline portion of the detector output samples;

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determining a slope of a second line fitted through a pulse rise portion of the detector output samples;

determining an intersection of the first line and the second line; and

determining a time difference between the intersection and a pre-selected sample time of a pulse rise portion sample.

15. A trigger circuit for a coincidence imaging system, said trigger circuit comprising:

an analog-to-digital converter coupled to a detector output;

a set of N accumulators coupled in a circuit parallel to the output of the analog-to-digital converter wherein N is a predetermined value; and

a shift register coupled to the output of said plurality of accumulators.

16. A trigger circuit in accordance with Claim 15 wherein successive elements of said shift register include:

$$\sum_{i=1}^{N} V_i, \ \sum_{i=1}^{N} V_{i+1}, \ \sum_{i=1}^{N} V_{i+2}, \ \sum_{i=1}^{N} V_{i+3}, \ \sum_{i=1}^{N} V_{i+4}, \ \sum_{i=1}^{N} V_{i+5}, \cdots$$

17. A trigger circuit in accordance with Claim 16 wherein when a coincidence event is detected, said shift register is configured to output at least one of a Q1, a Q2, a Q3, and a Q4, where

Q1 represents a sum of N values sampled immediately prior in time to a predetermined y-axis,

Q2 represents a sum of N values sampled substantially immediately subsequent in time to the y-axis,

Q3 represents a sum of N values substantially centered on the y-axis, and

Q4 represents a sum of N values sampled substantially prior in time to a start of a pulse rise of said detector output.

18.   A trigger circuit in accordance with Claim 17 further comprising an adder circuit configured to combine Q1 and Q2.

19.   A trigger circuit in accordance with Claim 17 further comprising an adder circuit configured to combine Q3 and Q4.

20.   A trigger circuit in accordance with Claim 17 further comprising a look-up table and a multiplier configured to combine Q2-Q1 and Q3-Q4.

21.   A trigger circuit in accordance with Claim 15 wherein said trigger circuit is configured to generate a trigger pulse at a determined time interval after a start of a coincidence pulse rise portion.

22.   A trigger circuit in accordance with Claim 15 wherein said trigger circuit is configured to time-stamp each trigger pulse.

23.   A trigger circuit for a coincidence imaging system, said trigger circuit comprising:

an analog-to-digital converter coupled to a detector output;

a plurality of N accumulators coupled to the output of the analog-to-digital converter wherein N is a predetermined value;

a shift register coupled to the output of said plurality of accumulators, said shift register configured to output at least one of a Q1, a Q2, a Q3, and a Q4, where:

Q1 represents a sum of N values sampled immediately prior in time to a predetermined y-axis,

Q2 represents a sum of N values sampled substantially immediately subsequent in time to the y-axis,

Q3 represents a sum of N values substantially centered on the y-axis, and

Q4 represents a sum of N values sampled substantially prior in time to a start of a pulse rise of said detector output.

24. A trigger circuit in accordance with Claim 23 wherein said trigger circuit is configured to generate a trigger pulse at a determined time interval after a start of a coincidence pulse rise portion.

25. A trigger circuit in accordance with Claim 23 wherein said trigger circuit is configured to time-stamp each trigger pulse.

26. A method for determining a coincidence event in a coincidence imaging system, said method comprising:

defining a first line corresponding to a baseline portion of a plurality of detector output sample values;

defining a second line corresponding to a pulse rise portion of a plurality of detector output sample values; and

determining an intersection of the first line and the second line, the intersection represents the time of the coincidence event.